

AMENDMENTS TO THE CLAIMS

1. (currently amended) A process for obtaining an organic acid from a feed stream comprising at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, comprising the steps of:
 - mixing a feed stream and at least one azeotroping agent, wherein the feed stream comprises at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, and wherein the organic acid of the salt, amide or complex is selected from the group consisting of monocarboxylic acids, dicarboxylic acids, and tricarboxylic acids having from 2 to 8 carbon atoms; and
 - distilling the feed stream by a method comprising the steps of
 - (i) heating at least one of the feed stream, the at least one azeotroping agent, or the mixture thereof, thereby (a) decomposing the ammonium salt, the amide, or the alkylamine-organic acid complex to produce organic acid, and (b) producing a first vapor stream that comprises at least one first azeotrope comprising the organic acid and the at least one azeotroping agent; and
 - (ii) separating the first vapor stream from the mixture.
2. (original) The process of claim 1 wherein the decomposing is done in a countercurrent fractional distillation apparatus.
3. (original) The process of claim 2, wherein the feed stream comprises an alkylamine-organic acid complex, and the feed stream is fed to the bottom of the fractional distillation apparatus.
4. (currently amended) The process of claim 2, wherein the feed stream comprises an alkylamine-organic acid complex, and the feed stream is fed to the middle of the fractional distillation apparatus, the at least one azeotroping agent is fed to the bottom of the fractional distillation apparatus, and there is reflux in the upper half of the fractional distillation apparatus.

5. (original) The process of claim 1, wherein the heating is done using a reboiler.
6. (previously presented) The process of claim 1, wherein the at least one first azeotrope is a minimum boiling azeotrope.
7. (previously presented) The process of claim 1, wherein the at least one first azeotrope is a heteroazeotrope.
8. (previously presented) The process of claim 1, wherein the feed stream further comprises at least one impurity, and wherein the at least one impurity is at a lower concentration in the first vapor stream than in the feed stream.
9. (previously presented) The process of claim 1, wherein the at least one azeotroping agent comprises a hydrocarbon and at least some water.
10. (previously presented) The process of claim 1, further comprising producing a first bottoms stream as the first vapor stream is separated, wherein the first bottoms stream comprises at least one of an organic acid ammonium salt, an organic acid amide, or an alkylamine-organic acid complex.
11. (currently amended) A process for obtaining an organic acid from a feed stream comprising at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, comprising the steps of:
mixing a feed stream and at least one azeotroping agent, wherein the feed stream comprises at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, and wherein the organic acid of the salt, amide or complex is selected from the group consisting of monocarboxylic acids, dicarboxylic acids, and tricarboxylic acids having from 2 to 8 carbon atoms; and
distilling the feed stream by a method comprising the steps of

(i) heating at least one of the feed stream, the at least one azeotroping agent, or the mixture thereof, thereby (a) decomposing the ammonium salt, the amide, or the alkylamine-organic acid complex to produce organic acid, and (b) producing a first vapor stream that comprises at least one first azeotrope comprising the organic acid and the at least one azeotroping agent;

(ii) separating the first vapor stream from the mixture;

(iii) producing a first bottoms stream as the first vapor stream is separated, wherein the first bottoms stream comprises at least one of an organic acid ammonium salt, an organic acid amide, or an alkylamine-organic acid complex;

~~The process of claim 10, further comprising~~

(iv) adjusting the temperature of the first vapor stream such that a second vapor stream that comprises a second azeotrope that comprises water and the at least one azeotroping agent is produced; and

(v) separating the second vapor stream from the first vapor stream, thereby producing a second bottoms stream, wherein the second bottoms stream comprises organic acid.

12. (original) The process of claim 11, wherein the second bottoms stream is a vapor, a liquid, or a vapor-liquid mixture.

13. (previously presented) The process of claim 1, wherein the at least one first azeotrope is a heteroazeotrope and further comprising condensing the first vapor stream to form a first liquid stream, wherein the first liquid stream is capable of being separated into a first phase and a second phase, wherein the first phase comprises a higher concentration of organic acid than the second phase, and wherein the second phase comprises the at least one azeotroping agent.

14. (previously presented) The process of claim 13, further comprising separating the first liquid stream into a first phase and a second phase, wherein the first phase comprises a higher concentration of organic acid than the second phase, and wherein the second phase comprises the at least one azeotroping agent.

15. (currently amended) A process for obtaining an organic acid from a feed stream comprising at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, comprising the steps of:

mixing a feed stream and at least one azeotroping agent, wherein the feed stream comprises at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, and wherein the organic acid of the salt, amide or complex is selected from the group consisting of monocarboxylic acids, dicarboxylic acids, and tricarboxylic acids having from 2 to 8 carbon atoms; and

distilling the feed stream by a method comprising the steps of

(i) heating at least one of the feed stream, the at least one azeotroping agent, or the mixture thereof, thereby (a) decomposing the ammonium salt, the amide, or the alkylamine-organic acid complex to produce organic acid, and (b) producing a first vapor stream that comprises at least one first azeotrope that is a heteroazeotrope comprising the organic acid and the at least one azeotroping agent;

(ii) separating the first vapor stream from the mixture;

(iii) condensing the first vapor stream to form a first liquid stream, wherein the first liquid stream is capable of being separated into a first phase and a second phase, wherein the first phase comprises a higher concentration of organic acid than the second phase, and wherein the second phase comprises the at least one azeotroping agent;

(iv) separating the first liquid stream into a first phase and a second phase, wherein the first phase comprises a higher concentration of organic acid than the second phase, and wherein the second phase comprises the at least one azeotroping agent; and

~~The process of claim 14, further comprising~~ (v) recovering the organic acid by separating the first phase from the second phase.

16. (original) The process of claim 15, wherein recovered organic acid is heat stable.

17. (original) The process of claim 15, wherein the recovered organic acid is an alpha hydroxy acid that is at least about 98% optically pure.

18. (original) The process of claim 15, wherein the feed stream comprises at least one impurity, and wherein the at least one impurity is at a lower concentration in the organic acid recovered from the separated first phase than in the feed stream.
19. (original) The process of claim 1, wherein the organic acid is selected from the group consisting of lactic acid, pyruvic acid, beta-hydroxybutyric acid, glycolic acid, propionic acid, and acetic acid.
20. (previously presented) The process of claim 1, wherein the feed stream comprises an organic acid amide selected from the group consisting of lactamide, pyruvamide, beta-hydroxybutyramide, propionamide, and acetamide.
21. (original) The process of claim 1, wherein the feed stream comprises a hydroxy acid.
22. (original) The process of claim 21, wherein the hydroxy acid is lactic acid.
23. (original) The process of claim 1, wherein the feed stream comprises a hydroxyamide.
24. (original) The process of claim 23, wherein the hydroxyamide is lactamide.
25. (previously presented) The process of claim 1, wherein the feed stream comprises a fermentation broth, wherein the fermentation broth comprises the organic acid ammonium salt, the organic acid amide, or the alkylamine-organic acid complex.
26. (previously presented) The process of claim 25, wherein the fermentation broth is concentrated prior to the mixing of the feed stream and the at least one azeotroping agent.
27. (currently amended) A process for obtaining an organic acid from a feed stream comprising at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, comprising the steps of:

mixing a feed stream and at least one azeotroping agent, wherein the feed stream comprises a fermentation broth, wherein the fermentation broth comprises at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, and wherein the organic acid of the salt, amide or complex is selected from the group consisting of monocarboxylic acids, dicarboxylic acids, and tricarboxylic acids having from 2 to 8 carbon atoms; and

distilling the feed stream by a method comprising the steps of

(i) heating at least one of the feed stream, the at least one azeotroping agent, or the mixture thereof, thereby (a) decomposing the ammonium salt, the amide, or the alkylamine-organic acid complex to produce organic acid, and (b) producing a first vapor stream that comprises at least one first azeotrope comprising the organic acid and the at least one azeotroping agent; and

(ii) separating the first vapor stream from the mixture;

~~The process of claim 25,~~ wherein the fermentation broth is at least partially purified prior to the mixing of the feed stream and the at least one azeotroping agent.

28. (previously presented) The process of claim 27, wherein the fermentation broth is purified using ion exchange prior to the mixing of the feed stream and the at least one azeotroping agent.

29. (previously presented) The process of claim 27, wherein the fermentation broth is acidified prior to the mixing of the feed stream and the at least one azeotroping agent.

30. (original) The process of claim 1, wherein a vacuum is used in removing the first vapor stream from the mixture.

31. (previously presented) The process of claim 1, wherein the at least one first azeotrope further comprises water.

32. (previously presented) The process of claim 1, wherein the at least one azeotroping agent is a hydrocarbon having a boiling point of between about 100 °C less than and 150 °C more than the organic acid boiling point.
33. (original) The process of claim 32, wherein the hydrocarbon has a boiling point of between about 50 °C less than and 50 °C more than the organic acid boiling point.
34. (original) The process of claim 32, wherein the hydrocarbon has 7 to 14 carbon atoms.
35. (original) The process of claim 34, wherein the hydrocarbon is selected from the group consisting of diethylbenzene, dodecane, decane, octylbenzene, propylbenzene, and ethylbenzene isomers.
36. (original) The process of claim 34, wherein the hydrocarbon is aromatic or aliphatic.
37. (original) The process of claim 36, wherein the aliphatic hydrocarbon is branched, unbranched, or cyclic.
38. (original) The process of claim 1, wherein the feed stream comprises between about 50 wt% and 95 wt% ammonium salt of the organic acid.
39. (original) The process of claim 38, wherein the ammonium salt is ammonium lactate.
40. (original) The process of claim 38, wherein the feed stream comprises less than about 10 wt% water.
41. (previously presented) The process of claim 1, wherein the process is a continuous process.
42. (original) The process of claim 1, wherein the process is a batch process.

43. (previously presented) The process of claim 1, wherein the at least one azeotroping agent that is mixed with the feed stream is a vapor.

44. (previously presented) The process of claim 43, wherein the mixing of the at least one azeotroping agent and the feed stream takes place in a column.

45. (previously presented) The process of claim 43, wherein the mixing of the at least one azeotroping agent and the feed stream takes place in a flash reactor.

46. (previously presented) The process of claim 43, wherein the mixing of the at least one azeotroping agent and the feed stream is countercurrent.

47. (original) The process of claim 1, wherein the process is performed at about atmospheric pressure.

48. (original) The process of claim 1, wherein the feed stream comprises a product produced by treating a polyester, wherein the product comprises at least one of organic acids, organic acid ammonium salts, organic acid amides, or mixtures thereof.

49. (currently amended) A process for obtaining an organic acid from a feed stream comprising at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, comprising the steps of:

mixing a feed stream and at least one azeotroping agent, wherein the feed stream comprises ~~The process of claim 1, wherein the feed stream comprises~~ an extract of a fermentation broth[[.]] that comprises at least one of an organic acid ammonium salt, an organic acid amide, or a alkylamine-organic acid complex, and wherein the organic acid of the salt, amide or complex is selected from the group consisting of monocarboxylic acids, dicarboxylic acids, and tricarboxylic acids having from 2 to 8 carbon atoms; and
distilling the feed stream by a method comprising the steps of

(i) heating at least one of the feed stream, the at least one azeotroping agent, or the mixture thereof, thereby (a) decomposing the ammonium salt, the amide, or the alkylamine-organic acid complex to produce organic acid, and (b) producing a first vapor stream that comprises at least one first azeotrope comprising the organic acid and the at least one azeotroping agent; and
(ii) separating the first vapor stream from the mixture.

50. (original) The process of claim 49, wherein the fermentation broth is concentrated prior to preparing the extract from it.

51. (original) The process of claim 49, wherein the fermentation broth is at least partially purified prior to preparing the extract from it.

52. (original) The process of claim 51, wherein the fermentation broth is purified using ion exchange.

53. (currently amended) The process of claim 49, wherein the extract is prepared by extraction with ~~an~~ a liquid extractant comprising alkylamine.

54. (original) The process of claim 53, wherein the alkylamine is selected from the group consisting of trilaurylamine and tri-n-octylamine.

55. (original) The process of claim 53, wherein the liquid extractant further comprises an extraction enhancer.

56. (original) The process of claim 53, wherein the organic acid is lactic acid and the extraction enhancer is octyl-lactate.

57. (original) The process of claim 53, wherein the liquid extractant further comprises a diluent.

58. (currently amended) The process of claim 1, wherein the at least one azeotroping agent is an ether having from 7 to 16 carbon atoms.